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Steps toward the hydrogen economy

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Abstract

The hydrogen economy is defined as the industrial system in which one of the universal energy carriers is hydrogen (the other is electricity) and hydrogen is oxidized to water that may be reused by applying an external energy source for dissociation of water into its component elements hydrogen and oxygen. There are three different primary energy-supply system classes which may be used to implement the hydrogen economy, namely, fossil fuels (coal, petroleum, natural gas, and as yet largely unused supplies such as shale oil, oil from tar sands, natural gas from geo-pressured locations, etc.), nuclear reactors including fission reactors and breeders or fusion nuclear reactors over the very long term, and renewable energy sources (including hydroelectric power systems, wind-energy systems, ocean thermal energy conversion systems, geothermal resources, and a host of direct solar energy-conversion systems including biomass production, photovoltaic energy conversion, solar thermal systems, etc.). Examination of present costs of hydrogen

production by any of these means shows that the hydrogen economy favored by people searching for a non-polluting gaseous or liquid energy carrier will not be developed without new discoveries or innovations. Hydrogen may become an important market entry in a world with most of the electricity generated in nuclear fission or breeder reactors when high-temperature waste heat is used to dissociate water in chemical cycles or new inventions and innovations lead to low-cost hydrogen production by applying as yet uneconomical renewable solar techniques that are suitable for large-scale production such as direct water photolysis with suitably tailored band gaps on semiconductors or low-cost electricity supplies generated on ocean-based platforms using temperature differences in the tropical seas.

Article Outline

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Methanol from atmospheric carbon dioxide : A liquid zero emission fuel for the future

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Résumé / Abstract
methanol is a promising liquid energy carrier for the storage of renewable energy. The comparison with hydrogen shows a lower total energy efficiency for methanol. But methanol is easy to handle within the existing transport and storage capacities of the petrol industry. Therefore it causes low investment costs for the infrastructure of a global renewable energy network. For the storage of small amounts of energy like in individual traffic and for the distribution of energy in low populated regions methanol is even the most efficient alternative. Beside hydrogen, a basic component for the synthesis of methanol is CO_2. The recovery of CO_2 from atmosphere will avoid an infrastructure for CO_2-transport to the place where methanol is generated. With solar energy as the energy source a lower energy demand for the recovery of CO_2 from atmosphere than from combustion fluegases can be achieved. An integration of biomass as basic product for the synthesis of methanol improves the conversion efficiency from solar energy to methanol.

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